Terrestrial Animal Health Standards Commission February 2016

DRAFT CHAPTER 6.X.

PREVENTION AND CONTROL OF *SALMONELLA* IN COMMERCIAL CATTLE PRODUCTION SYSTEMS

Article 6.X.1.

Introduction

Nontyphoidal salmonellosis is one of the most common food-borne bacterial diseases in the world with *Salmonella* Enteritidis and *S.* Typhimurium (including monophasic variants) being the predominant serotypes identified in humans in most countries. *S*. Enteritidis is primarily associated with *poultry*, while *S*. Typhimurium may be present in many mammalian and avian hosts. These serotypes and several others occur at variable prevalence in cattle depending on the region. For example, in some countries *S*. Dublin and *S*. Newport may also cause salmonellosis in humans.

Salmonella infection in cattle is mostly subclinical, although clinical *disease* such as enteritis, septicaemia or abortion may occur. Subclinical *infection,* including a carrier state, can be of variable duration and can play an important role in the spread of *Salmonella* within and between *herds* and pose a public health *risk*.

Herd size and stocking density may influence the likelihood of introduction, dissemination or persistence of *Salmonella*; however, this is also dependent on geographical region, husbandry and other factors such as season and age.

Salmonella serotypes and their *prevalence* in cattle may vary considerably within and between farms, countries and regions. It is important for *Veterinary Authorities* and the producers to consider types of *Salmonella*, their occurrence and the *disease* burden in cattle and human populations when they develop and implement strategies for the prevention and control of *Salmonella* in commercial cattle production systems.

Article 6.X.2.

Definitions

For the purposes of this chapter:

Commercial cattle production systems: means those systems in which the purpose of the operation includes some or all of the breeding, rearing and management of cattle for the production of *meat* or *milk.*

Intensive cattle production systems: means commercial systems in which cattle are in confinement and are fully dependent on humans to provide for basic animal needs such as food, shelter and water on a daily basis.

Extensive cattle production systems: means commercial systems in which cattle have the freedom to roam outdoors, and where the cattle have some autonomy over diet selection (through grazing), water consumption and access to shelter.

Feed: means any material (single or multiple), whether processed, semi-processed or raw, which is intended to be fed directly to terrestrial *animal*s (except bees).

Feed ingredient: means a component part or constituent of any combination or mixture making up a feed, whether or not it has a nutritional value in the *animal*'s diet, including feed additives. Ingredients are of plant (including aquatic plants) or terrestrial or aquatic animal origin, or other organic or inorganic substances.

Semi-intensive cattle production systems: means commercial systems in which cattle are exposed to any combination of both intensive and extensive husbandry methods, either simultaneously or variably according to changes in climatic conditions or physiological state of the cattle.

Article 6.X.3.

Purpose and scope

This chapter provides recommendations for the prevention and control of *Salmonella* in commercial cattle production systems in order to reduce the burden of *disease* in cattle and the *risk* of human illness through food-borne contamination as well as human *infections* resulting from direct or indirect contact with infected cattle.

This chapter applies to cattle (*Bos taurus*, *B. indicus* and *B. grunniens*), water buffaloes (*Bubalus bubalis*) and bison (*Bison bison* and *B. bonasus*) kept in commercial cattle production systems.

This chapter should be read in conjunction with the Codex Alimentarius Code of Hygienic Practice for Meat (CAC/RCP 58-2005), Code of Hygienic Practice for Milk and Milk Products (CAC/RCP 57-2004), Code of Practice of Good Animal Feeding (CAC/RCP 54-2004), and the Guidelines for the Control of Nontyphoidal *Salmonella* spp. in Pork Meat (under development), and the OIE/FAO Guide to Good Farming Practices for Animal Production Food Safety.

Article 6.X.4.

Objectives of prevention and control measures

It is recommended that prevention and control measures be focused on those types of *Salmonella* of greatest consequence to cattle or public health.

Prevention and control measures in commercial cattle production systems may:

1) reduce the prevalence and concentration of *Salmonella* entering the *slaughterhouse/abattoir* and therefore decrease the challenge to the slaughter and dressing procedures and the likelihood of bovine *meat* contamination;

2) reduce the likelihood of *Salmonella* contamination in *milk;*

3) reduce *Salmonella* contamination of the environment via cattle faecal waste, which in turn will limit *infection* of *animals* (including *wildlife*);

4) reduce the likelihood of *infections* in humans through contact with infected cattle or contaminated material.

While control in the primary production phase can decrease the number of animals carrying or shedding *Salmonella,* controls after primary production are also important to minimise the contamination and cross-contamination of carcasses and *meat products*.

Articles 6.X.5.to 6.X.16. provide recommendations for the prevention and control of *Salmonella* in commercial cattle production systems.

These recommendations may also contribute to the prevention and control of some other *infections*.

Article 6.X.5.

Biosecurity

Biosecurity is intended to assist with the prevention and control of *Salmonella*. A *biosecurity* management plan should be developed according to the commercial cattle production systems employed e.g. intensive or extensive. The applicability of the measures, described below, will vary according to the type of commercial cattle production system.

When including *Salmonella* as part of a *biosecurity* management plan it is recommended that the following be addressed:

1) location, design and management of the *establishment*;

2) veterinary supervision of cattle health;

3) management of the introduction and mixing of cattle;

4) training of personnel in their responsibilities and their role in animal health, human health and food safety;

5) maintenance of records including data on cattle health, production, movements, medications, *vaccination*, and mortality, and cleaning and *disinfection* of farm buildings and equipment;

6) availability of test results to the farm operator when *Salmonella surveillance* is conducted;

7) removal of unwanted vegetation and debris that could attract or harbour pests around cattle premises;

8) minimising the entry of *wild* birds into cattle buildings and feed stores;

9) cleaning and *disinfection* procedures for buildings in which cattle are handled or housed. For example, the cleaning and *disinfection* procedures for intensive calf housing, calving areas and sick pens after emptying may include feeders, drinkers, floor, walls, aisles, partitions between pens, and ventilation ducting. All visible organic material should be removed before *disinfection.*

   When chemical disinfectants are used, the effective concentration and contact time for *Salmonella* should be considered and the choice of disinfectant should take into account the cleaning process. Surfaces should be allowed to dry after *disinfection*. Disinfectants should be used in accordance with Chapter 4.13.;

10) control of pests such as rodents and arthropods and regular assessment of effectiveness;

11) control and hygienic procedures for entry and movement of persons and *vehicles*;

12) cleaning and *disinfection* of equipment and *vehicles* identified as posing a *risk*;

13) storage and disposal of dead animals, bedding, faeces and other potentially contaminated farm waste in a manner that minimises the likelihood of dissemination of *Salmonella* and prevents the direct or indirect exposure of humans, livestock and *wildlife* to *Salmonella*. Particular care should be taken when cattle bedding and faeces are applied to land used for horticultural crops intended for human consumption.

Article 6.X.6.

Location and design of cattle establishments

When making decisions on the location and design of cattle *establishments,* it is recommended that reduction of the likelihood of transfer of pathogens, including *Salmonella*, from major sources of contamination be considered. Sources of *Salmonella* may include other livestock *establishments* or areas of application or disposal of contaminated waste or effluent. Other sources and *vectors* of *Salmonella* include *vehicles*, *equipment*, water-courses, persons, domestic animals, birds, rodents, flies and *wildlife*.

It is recommended that the design of intensive cattle production systems consider the following:

1) management of faecal waste to minimise contamination of the *establishment*;

2) adequate drainage for the site and control of run-off water and untreated waste water;

3) use of materials for construction that facilitate effective cleaning and *disinfection*;

4) control of entry and movement of *vehicles*, equipment and persons;

5) preventing contamination of feed and water during storage and distribution;

6) cattle handling and movements to minimise stress and spread of *Salmonella infection*;

7) separation of cattle according to likelihood of *infection* with, or susceptibility to, *Salmonella*;

8) restriction of entry of domestic animals, birds, rodents, flies and other relevant *wildlife*.

In extensive cattle production systems, location and design options may be limited; however, applicable biosecurity measures should be considered.

Article 6.X.7.

Management of cattle introductions

To minimise the likelihood of introducing *Salmonella* through cattle introductions, it is recommended that:

1) good communication within the cattle industry be encouraged to raise awareness of the likelihood of introducing *Salmonella* through cattle introductions;

2) consideration be given to minimising the number of sources of replacement cattle;

3) the introduction of new genetic material through the use of semen and embryos be considered whenever practicable;

4) if possible, cattle be sourced directly from *herds* of origin because live animal markets or other places where cattle from multiple properties are mixed for resale may increase the likelihood of spread of *Salmonella* and other infectious agents among cattle;

5) newly introduced cattle be kept separate from the rest of the *herd* for a suitable period before mixing with other cattle, e.g. four weeks;

6) where appropriate, testing of animals for *Salmonella* prior to introduction be considered to inform subsequent control measures, for example, when introducing cattle of unknown status.

Article 6.X.8.

On farm cattle management

To reduce the likelihood of transferring *Salmonella* among cattle, it is recommended that:

1) cattle with suspected salmonellosis be separated from healthy cattle;

2) care of healthy cattle be carried out prior to care of cattle with suspected salmonellosis;

3) priority be given to the hygienic management of calving areas, for example keeping perinatal cattle separated from sick cattle and maintaining a clean environment;

4) when possible, the ‘all-in-all-out’ principle for production cohorts be used. In particular, the unnecessary mixing of different age groups, especially of calves, should be avoided;

5) consideration be given to the potential for between-herd transmission of *Salmonella* via breeding, rearing and grazing of cattle from multiple sources on a single site, for example shared pasture, heifer rearing or sharing of bulls;

6) consideration be given to the potential for between-herd transmission of *Salmonella* through direct contact between cattle across boundary lines or indirectly, for example through contamination of water courses.

Article 6.X.9.

Feed

Feed and feed ingredients

Feed and feed ingredients can be sources of *Salmonella infection* for cattle. For the effective control of *Salmonella* it is recommended that:

1) When appropriate, feed and feed ingredients be produced, handled, stored, transported and distributed according to Good Manufacturing Practices, considering Hazard Analysis Critical Control Points (HACCP) principles and recommendations in accordance with Chapter 6.3.

2) Where practical, feed and feed ingredients be transported, stored and fed in a hygienic manner that minimises contamination by manure and access by domestic animals, birds, rodents and *wildlife*.

Article 6.X.10.

Water

Drinking water should be of an appropriate quality. When there is reason to be concerned about *infection* of cattle with *Salmonella* from contaminated water, measures should be taken to evaluate and minimise the *risk*. For example sediment in water troughs may act as a reservoir for contamination. Where practicable, untreated surface water should be avoided as a water source.

Article 6.X.11.

Additional prevention and control measures

1) The immune status of calves is important and therefore care should be taken to ensure that new-born calves consume adequate amounts of high quality colostrum in accordance with Article 7.9.5. (point 3c) and Article 7.X.5).Raw milk from infected cows should not be fed to calves.

2) *Vaccination* may be considered as part of a *Salmonella* control programme. Vaccine production and use should be in accordance with Chapter 1.1.6. of the *Terrestrial Manual*. The protective effect of vaccines is generally serotype specific and is influenced by factors such as timing of *vaccination* in relation to exposure.

3) A number of conditions, for example liver fluke and infection with bovine viral diarrhoea virus, may increase the susceptibility of cattle to *Salmonella*; therefore, control of such conditions is recommended.

4) *Antimicrobial agents* can be used for treatment of clinical salmonellosis and when administered, it should be in accordance with Chapter 6.9. However, *antimicrobial agents* should not be used to control subclinical *infection* with *Salmonella* in cattle because the effectiveness of the treatment is limited, they may increase the risk of *Salmonella* colonisation, and their use can contribute to the development of antimicrobial resistance.

Article 6.X.12.

Transportation

Hygienic maintenance of *vehicles* is recommended.

When transporting animals from multiple *establishments,* it is recommended that the *Salmonella* status of the *establishments* be considered to avoid cross-contamination of cattle.

The relevant recommendations in Chapters 7.2., 7.3. and 7.4. apply.

Article 6.X.13.

Lairage

Relevant aspects of *lairage* management include consideration of effective cleaning and *disinfection* between groups, minimising mixing of animals that have not continuously been kept together and managing stress.

In addition the relevant recommendations in Articles 7.5.1., 7.5.3. and 7.5.4. apply.

Article 6.X.14.

Cleanliness of hides

Cleanliness of hides can be achieved by applying suitable practices during housing (for example additional clean bedding), transport and lairage. Dirty hides increase the risk of microbial contamination of carcasses during the slaughter process. Contamination can be reduced by hide washing of the live animal or of the slaughtered animal before hide removal.

Article 6.X.15.

Surveillance for Salmonella in commercial cattle production systems

Surveillance data provide information to assist the *Competent Authorities* in their decision making regarding the requirement for, and design of, control programmes and in setting and verifying performance objectives.

Standards for diagnostic tests are described in the *Terrestrial Manual*. In addition, other sampling and testing methodologies such as testing of bulk milk or serum samples by ELISA may provide useful information on herd or individual animal status. Boot swab samples from communal areas in cattle housing, slurry samples, or caecal or lymph node samples collected post-mortem can also be useful for microbiological testing. Some types of *Salmonella* such as *S*. Dublin can be difficult to detect using microbiological methods.

If serology is used as the *surveillance* method, it may not be possible to distinguish between vaccinated and infected cattle by means of serological testing.

Article 6.X.16.

Prevention and control in low prevalence regions

In regions where *Salmonella infection* of cattle is uncommon, it may be possible to maintain low prevalence status or eliminate *infection* from *herds* through a combination of good farming practices, *herd surveillance,* individual testing, movement controls, or removal of persistent carriers.

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